Zero Retries issue 0018 2021-11-12

Advanced Amateur Radio - Data Communications; Space; Microwave… the fun stuff! Nothing great has ever been accomplished without irrational exuberance - Tom Evslin. Irrational exuberance is pretty much the business model of Zero Retries - Steve Stroh N8GNJ The Universal Purpose of Ham Radio is to have fun messing around with radios - Bob Witte K0NR. We are confronted by insurmountable opportunities! - Pogo

Steve Stroh N8GNJ, Editor

Jack Stroh, Late Night Assistant Editor

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Request to Send

In my meanderings around Twitter in my guise as Zero Retries Newsletter, I came across this cautionary tale for Zero Retries: Russel Mooth K4HCK's **Amateur Radio Weekly**. ARW seemed to be a nice newsletter of links to interesting Amateur Radio stories, but it ends abruptly at Issue 235 on 2019-03-30 with no hint of why that was the last issue. Food for thought. For the moment, writing Zero Retries is still some of the most fun I've ever had but I have many weeks to go before I begin to threaten K4HCK's stamina.

I haven't yet installed the Hisense 65" 4k television (discussed in Zero Retries 0017) as my main monitor in my office. It's a big one, probably a two-person job, and I had some urgent writing to do including this issue of Zero Retries. Setting it up is in the "very soon" queue so that if it doesn't work out, I'll be within the Costco return window.

HYS TC-8900R - 29 MHz, 50 MHz, 144 MHz, and 440 MHz "Data" Radio

Photo courtesy of Newegg.com

I recently became aware of the HYS TC-8900R because it has the rare combination of having the standardized “flat audio” 6-pin Mini-DIN (aka,”Data” connector) *and* coverage of the (US) Amateur Radio 50-54 MHz (6 meter) band.

It’s not that Amateur Radio bands, especially the 440-450 MHz band, are in danger of “getting full” for data communications, it’s that for some emergency communications situations, the ability to have multiple radios transmitting and receiving simultaneously is an increasing necessity. When, for example, you’re using multiple radios on the 144-148 MHz band, when one radio transmits, it effectively “jams” any other nearby radio in the same band. This can be overcome by applying radio frequency filters, but that negates the ability to change frequencies. Since Amateur Radio has multiple bands available, simultaneously operating on multiple bands is an “easy” fix. Easy as it doesn’t require filters, but it does require multiple antennas.

So the HYS TC-8900R is an interesting solution to that issue. You can do the same data communications on 50-54 MHz as you do with any of the other VHF / UHF Amateur Radio bands. Although the HYS-8900R can do 29 MHz, there are channel width restrictions in that band that limit data communications speeds, so it’s not quite so useful. Another issue with such radios is that it’s tough to “sort out” all four bands into one “quadplexer” to have antennas for all four bands connected simultaneously, thus it’s probably more practical to just use a broadband antenna such as a Diamond D130NJ “discone”.

The most “name brand” vendor I can find for this radio is… Newegg; price is $275 and shipping is “10 - 32 days, from China”. In this era, that seems fraught with peril.

I have no personal experience with this radio, and although it’s on my “I’m curious about it” list for potential investigation at N8GNJ Labs… it’s pretty low on the priority list. Thus I’d welcome reports from Zero Retries readers that have experience with this radio for data communications.

TYT TH 9000D Monoband Radios Can Be Modified for Data

Andy Sayler KF7VOL who is a friend and fellow instigator in Amateur Radio experimentation and progress here in Whatcom County recently chimed in on a mailing list discussion of data radios. KF7VOL pointed out that the TYT TH 9000D family of monoband radios is available from Amazon (no link - just search TH 9000D) for approximately $125, and all have very similar specifications, such as maximum transmit power of approximately 50 watts. There are three models (all claiming to be the same model - TH 9000D, distinguished only by the frequency range):

- RX: 136 - 174 MHz; TX: 144 - 148 MHz. FCC ID: PODTH-9000DV
- RX: 220 - 260 MHz, TX: 222 - 225 MHz. FCC ID: PODTH-9000DV2
- RX: 400 - 490 MHz, TX: 420 - 450 MHz. FCC ID: PODTH-9000DU

The interesting part is that apparently these radios are “easily” modified for data use, per this article - How to build a repeater from two TYT-9000 Mobile Transceivers - The “Aggrandizer” Project:

> Dan (VA3OT) provided information about the TYT TH-9000, what he found was that "all the necessary connections needed to make a functioning repeater" was present on a 6-Pin board mounted socket:
>
> Pin 1 - Ground
> Pin 2 - TX Audio
> Pin 3 - Carrier Operated Squelch (COS)
> Pin 4 - RX Audio
> Pin 5 - Push To Talk (PTT)
> Pin 6 - +5 volts
>
> Dan went on to state "The TYT TH-9000 has a plastic cover hiding a machined opening to fit a 9 pin serial port, complete with 2 threaded holes to mount a serial port".

The "9 pin serial port" referred to is actually a 9-pin DSUB connector (nothing to do with "serial port"). Alinco uses a Female 9-pin DSUB on some of their radios. If you do this modification and wire it the same as Alinco radios, you can use the Masters Communications Model Alinco-6 adapter for a plug-and-play conversion to the standard 6-pin MiniDIN connector. *The email version of this newsletter incorrectly suggested the use of the Model DIN-6 adapter, which is similar.*

This is an interesting development (to me; this info has apparently been available since 2014). For the low cost of these radios, and the apparent ease of modification to get a data radio that may well work for high speed data communications like 9600 bps packet radio and VARA-FM Wide, these radios will soon find their way somewhere in the middle of the priority list at N8GNJ Labs, especially the 222-225 version. They seem inexpensive enough to buy multiple units and do the conversion on multiple units.

New Raspberry Pi OS - Bullseye

Simon Long for Raspberry Pi Foundation, 2021-11-08:

> Every two years, Debian Linux, on which Raspberry Pi OS is based, gets a major version upgrade. Debian 'buster' has been the basis of Raspberry Pi OS since its release in 2019, and Debian 'bullseye' was released in August. (As some of you may know, Debian names their versions after characters in Disney / Pixar's Toy Story films – Bullseye was Woody's horse in Toy Story 2.)
>
> We've been working on the corresponding 'bullseye' release of Raspberry Pi OS; it's taken a bit longer than we'd hoped, but it is now available.
>
> So what is new this time? Debian 'bullseye' has relatively few major changes which are visible to users – there are some under-the-hood changes to file systems and printing, but most of the changes are patches and upgrades to existing applications and features. However, over and above the changes in Debian itself, the 'bullseye' version of Raspberry Pi OS has a number of significant changes to the desktop environment and to the support for Raspberry Pi hardware.

I had never made that connection on the name of the Raspberry Pi OS, but then I had to look up to see who "buster" was in Toy Story:

> Buster is a dachshund in the Disney / Pixar Toy Story film series who formerly belonged to Andy Davis, who received him as a puppy for Christmas at the end of the first film, but made his first full appearance as a grown-up dog in the second film and grew old in the third film.

Now you know too 😊

In my reading, there is only one significant new feature in bullseye - the video driver is now "KMS (kernel modesetting)" rather than the previous a proprietary "blob" (my inexpert understanding) that could not be accessed by other software running on a Raspberry Pi. I've seen the issue about video drivers for Raspberry Pi not being open source as a knock against the Raspberry Pi, and apparently that's no longer an issue. Us regular users of Raspberry Pi OS will likely never know, or care about this now-former issue, other than video will likely work better in the coming years.

One visible new feature of bullseye is a built-in Updater; if your Raspberry Pi is Internet-connected, it will now "phone home" to see if there are updates available, and notify you if there are - click to update. I think that's generally a good thing for the majority of users, but there are probably some that won't like it. At least it's not the "*you **will** be updated!*" approach of another popular operating system.

Long explains that it's generally not a good idea to try to update an existing installation for a new major version of the OS; start from scratch with the new OS and add your customizations to the new OS.

The biggest news, to me, is that Raspberry Pi OS remains 32-bit. In a comment following the article, Long said:

> In all our testing and benchmarking, 64-bit doesn't offer any significant speed advantage in the majority of typical use-cases.

Fair enough - 32 bit works fine… it's just that "64 bit", especially on a $35 or $70 computer is *cooler*.

But wait… there's *more*!

> Bullseye bonus: 1.8GHz Raspberry Pi 4
>
> But some of you may have noticed another upgrade. Users with recent Raspberry Pi 4 devices will find that their default turbo-mode clock has increased from 1.5GHz to the 1.8GHz used on Raspberry Pi 400. "Recent" in this case means any 8GB Raspberry Pi 4, or a 2GB or 4GB board with the extra components circled in the image below. This is the dedicated switch-mode power supply ("switcher") for the SoC core voltage rail, and was introduced when we shuffled the allocation of switchers to rails to support 8GB.

One minor issue I've noticed with the Raspberry Pi 400 I use at the Bellingham Makerspace is that graphics-heavy web pages, driving two monitors, isn't exactly snappy even with the RPi 400's 4 GB of RAM. Perhaps trying out the overclocking might fix that issue - the 400 has a *very* large heat sink so there's no danger of overheating the CPU. I might also try the 64-bit version (still experimental) - it's just another micro SD card.

More on Amateur Radio Backup Power

The discussion topic at this week's Mount Baker Amateur Radio Club's general meeting was backup power. Here are some pointers to some good info that came out of that discussion.

YouTube - DC Power. The West Mountain Way.

This video is an excellent introduction on four components that are needed in an Amateur Radio backup power system - power monitor (PWRcheck) to monitor the battery, low voltage / high voltage disconnect (PWRguard Plus), battery charger / battery bypass when there's power (PWRgate PG40S) and distribution (RIGrunner 4008). Though this video is now seven years old and some components have been updated, it's still a good overview. I've had a very similar system powering my shack for more than a year now, and I picked up a couple of tricks from this video.

Photo courtesy of Steven K. Roberts / microship.com

The Shacktopus Portable Power Cart was a 2015 project by my friend Steven Roberts N4RVE who lives aboard the good ship Datawake in Friday Harbor, Washington. As with all projects that N4RVE tackles, there are no half measures, only gonzo engineering. The SPPC is built on a lightweight aluminum hand truck. The electronics units you see in the photo above are all mounted on the back side of the hand truck, and the tongue of the hand truck supports the (heavy) large battery. The goal of Shacktopus was to integrate *all* the bits needed for backup power for 12 volt loads into one "portable" unit. (At least it moves on wheels.) As you can see, all the units mentioned in the West Mountain radio video are present on the Shacktopus, plus a solar charge controller, and an AC inverter.

NEUTRAL
FLOATING
2.4A
5VDC
120V AC
1.25A
150W
ONE+

Photo courtesy of Steve Stroh N8GNJ

Finally, my portable power needs for emergency spot power are nicely satisfied by these two devices which are designed to work together:

- Ryobi ONE+ 18V Lithium-Ion 9.0 Ah LITHIUM+ HP High Capacity Battery
- 150-Watt Power Inverter for ONE+ 18V Battery

I bought the Ryobi 9.0 Ah battery out of frustration that I required multiple (smaller) battery packs for my battery powered leaf blower to blow off the very long driveway at my former home. This 9.0 Ah beast of a battery solved that problem nicely. Mercifully, I no longer have to tend that driveway, but the 9.0 Ah battery, plus the inverter was such a useful combination that I bought two more batteries and two more inverters.

The combination of these two units provides sufficient AC power for small loads - powering a small television, computer, Internet modem, even a nighttime positive pressure breathing device. It also provides 2x USB high power charging ports, and even a small built-in light, and can be carried in one hand. The battery has a built in charge display. In my purchase of various Ryobi power tools and yard tools, I accumulated drop-in ample battery chargers. There's even a battery charger available for use in cars (12 volt input with cigarette lighter plug). The only minor downside to this unit is that native voltage of the battery is 18 volts, and I haven't found a method (that I consider safe) to convert 18 volts to 12 volts. Any such units that I've looked at simply didn't seem sufficiently well-built / safe (to me).

I find these units to be ideal for providing power when / where you need it. The self-discharge is only noticeable after about six months, dropping one or two bars at most, which is the work of 30-60 minutes on the drop in charger.

ZR > BEACON

- ***Midwest Microwave***
  Sometimes it almost feels like Zero Retries has "staff" when "Zero Retries Interesting" information surfaces so regularly from one source like Jeff Davis KE9V:
  Thanks to the efforts of Gedas, W8BYA, in Ft. Wayne, Indiana 10 GHz activity in the Midwest has taken a big step forward. He has inspired a lot of hams around this area to get on the air more often and it's been fun to watch the action grow. There's a group (Midwest Microwave) and a mailing list where the microwave crowd can hang out.
  To me, microwave experimentation is a fascinating part of Amateur Radio!

- **Designing Electronics That Work**
  The other "almost staff" frequent contributor of "Zero Retries Interesting" information is Dan Romanchik KB6NU:
  I'm going to steal an idea from my friend, Steve Leibson. He recently wrote a book review of Designing Electronics That Work by Hunter Scott, and I found the book so good that I thought I'd write a review of my own. TL;DR: This is a great book, and what makes it even greater is that the PDF version is free. (Print copies are available for $39.)
  As Scott says in the preface, "This book is a collection of tips, techniques, and tricks that generally take a small amount of time and effort to implement, but have a disproportionate effect on the outcome of a design."
  I just glanced at the PDF version and found it fascinating. I suspect the paper version is going to soon grace my Amateur Radio bookshelf.

- **ASRTU-1 CubeSat with V/u FM Transponder Submitted for IARU Coordination**
  From ARRL News 2021-11-03:
  China's Harbin Institute of Technology has applied for IARU Coordination of the ASRTU-1 CubeSat. Among other capabilities, the satellite will provide a V/u FM amateur radio transponder. ASRTU-1 is a 12U CubeSat mission designed by Russian and Chinese university students for education and amateur radio.
  Harbin Institute of Technology has successfully developed several amateur radio satellites, including LilacSat-2 (CAS-3H), LilacSat-1 (LO-90), DSLWP-A (LO-93), and DSLWP-B (LO-94). A new SDR-based transceiver was developed for ASRTU-1 to provide communication and experiment resources to radio amateurs, including a V/u FM transponder, a UHF telemetry downlink, and a 10.5 GHz image downlink. The satellite will also allow radio amateurs to send commands to control the satellite to take and download images.
  ASRTU is planned for a launch from Russia in the fourth quarter of 2022.
  The 10.5 GHz downlink sounds cool! Despite the reference to IARU, a search on their website for ASRTU-1 didn't provide any additional information. Checking a web search engine only found referrals to this ARRL article.

- **Starlink Quietly Slips out of Beta Testing**
  Starlink is a low earth orbit satellite constellation that provides real (as in low-latency, high speed, no transfer caps) broadband Internet service

nearly anywhere in rural areas in the US and some other countries. Starlink had been in “beta test” mode since mid-2020 or so with very limited availability, but that ended 2021-10-31. There’s no overt change in Starlink other than if you go to their web page, there’s now no reference to the Starlink service being in beta testing. Now the web page says:
Starlink provides high-speed, low-latency broadband internet across the globe. Within each coverage area, orders are fulfilled on a first-come, first-served basis. Type in your service address and click the Order Now button.
Apparently there is much more demand than what Starlink can currently provide, so Starlink is “metering” new customers as Starlink’s capacity gradually increases as new satellites are added and they can deploy new ground stations throughout the US.

- **Ham radio CubeSats to deploy from ISS include one on 76 GHz**
Southgate Amateur Radio News 2021-10-03:
It is expected four CubeSats carrying amateur radio payloads will be deployed on the morning of Wednesday, October 6, one of them has 76 GHz capability
On the AMSAT Bulletin Board Masa JN1GKZ writes:
JAXA announced four CubeSats deploy from ISS at Oct 6 with J-SSOD. The satellites are Binar-1, Maya-3, Maya-4 and CUAVA-1. All the satellites operate on amateur band.
You don’t see 76 GHz and Amateur Radio satellite in the same sentence too often. There were too many links to properly excerpt this - see the link for all details.

- **SatNOGS COMMS**
SatNOGS COMMS is a versatile telecommunications solution suitable for nano-satellites and Cubesats, operating in UHF and S-band, and featuring tight integration with SatNOGS Network. The scope spans from the space segment transceiver to the ground segment station.
This is another random interesting item I came across in my late night Twitter meanderings. I wish there was more general information about this, but the repository only has the technical minutiae, no overview / background information about this radio system. I’m still hoping that someone will develop at least a reference design to be able to put the equivalent of a satellite transponder on a high site (the Willis [formerly Sears] tower in Chicago comes to mind).

- **Repeater Builder**
Repeater Builder is one of those corners of Amateur Radio that offers distilled wisdom. RB has been explaining, in detail (approximately forever) how to modify radios to bring out “flat audio” connections that repeaters need for good audio, as well as other modifications such as frequency / band changes, amplifier modifications, etc. High speed data communications such as 9600 bps packet radio and VARA FM work best with flat audio. If you want to try to use a surplus commercial radio (such as Motorola radios) to do high speed data, the info is probably at Repeater Builder.

Feedback Loop

- **Tadd Torborg KA2DEW on ZR 0002**
NinoTNC scores over the software packet modems in ease of configuration, scalability, diagnostic tools (LEDs, scope hookups, TEST-TX button, built in packet TX and RX for link testing). You can have a dozen NinoTNCs on a network switch if needed. An average of about 2.5 radios per switch is about right for a successful VHF/UHF data network.
Software TNCs don't need hardware. Really? The recommended additional (sound-card) hardware has changed several times while I have paid attention, and the cabling requirements to hook up the radios don't usually come up in the conversation. If you can get a hardware TNC with USB connection for $25 (@quantity 10 or so), with all of the most excellent control/display built-in, is it really obvious that the software TNC (with its required sound hardware and home-brew cables, configuration complexities, zero LEDs of display) is that much better a deal?
Tadd - Thanks for following up with your input on ZR 0002. Software TNCs do have issues, especially complexity. In ZR 0002, I was trying to do a fair survey of the various devices for data communications on Amateur Radio VHF / UHF. What TAPRN is doing is worth devoting an entire issue of Zero Retries, to which I haven’t yet allocated enough time. There’s *much to admire* about what you, Nino, and the rest of the TAPRN users have done with continually improving the NinoTNC. In your comment you do a good job mentioning some points that I didn’t about the NinoTNC. The primary thing that recommends an audio interface and host software approach is that packet isn’t the only mode that’s useful on Amateur Radio VHF / UHF. Thus my Nexus DR-X is flexible, able to do 1200 bps or 9600 (or 2400, or 4800 or perhaps even faster than 9600) packet radio, *or* fsq (one of the fldigi modes) or numerous other modes. But, I accept your (implied) point - for an always-active packet radio link like a TARPN node, the NinoTNC is a better option than a software-based unit.

- **Tadd Torborg KA2DEW on ZR 0017**
Thanks for the article on the FTM6000R. I also want to see this work. If you get two of them, could I send you a pair of NinoTNCs to play against them? Inquiring minds want to know!
Tadd - I would welcome a pair of NinoTNCs to test with the FTM-6000R though as I mentioned, I’m full up on radios at the moment, though it would certainly be worth the effort to benchmark a pair of FTM-6000R versus a pair of TM-D71As, and test the interoperability between the two different radios. If the FTM-6000R seems workable as a data radio for individual shack use, that would free up my small supply of TM-D71As for deployment for a few more Multipurpose Remote Nodes where the remote frequency control is a real asset. I’ll be curious to see if the TYT TH 9000D radios with the suggested data connector modification (discussed in this issue) will be of interest to TARPN users? With TAPRN’s network architecture of point-to-point links, a low-cost monoband radio, especially one that potentially could do 9600 bps, might be quite useful.

- **Jim Hooper (Hoop) K9QJS on ZR 0017**
*Check **Ham Made Parts** - https://hammadeparts.com for a cable for the new Yaesu rig [FTM-6000R].*
Hoop - thanks for that reminder. Indeed - Leslie Poston WY0GTR of Ham Made Parts does a great job. HMP offers a wide variety of cables for connecting audio interfaces to radios. If you don’t see what you need in their existing products, just describe what you need. If they can get the parts (connectors), they’ll likely be able to make it for you.

- **Bill Dornbush AA6BD on ZR 0017**
In issue 0017, you commented about MIT and remote exams. I have assisted PARC at Auburn University with their online exams and I believe they have done a lot more than 250 exams. See https://parcradio.org/pages/online.html I moved so I am not currently helping them while I adjust to my new location.
Bill - thanks for the input on PARC and Auburn’s remote testing. I simply wasn’t aware that (so many) remote Amateur Radio exams are now routine and ongoing.

Contributors This Issue

My thanks to:

- Jeff Davis KE9V for his usual spotting of good stories that I missed.
- Dan Romanchik KB6NU for his usual spotting of good stories that I missed.
- Andy Sayler KF7VOL for mention of the TYT 9000D radios.

Closing The Channel

Zero Retries is on Twitter - @zeroretries / Zero Retries Newsletter

If you're not yet licensed as an Amateur Radio Operator, and would like to join the fun by *literally having a license to experiment with radio technology*, here are some pointers:

- Dan Romanchik KB6NU offers free PDF versions of his *great* **No-Nonsense Study Guides**.
- HamExam.org Amateur Radio Practice Exams offers good **Flash Card and Practice Exams**.
- When you're ready to take an **Amateur Radio examination** (Tech, General, or Extra), W1MX - The MIT Amateur Radio Society offers remote exams, free for students and youngsters. *There are apparently many other remote exam options*.

Bonus - with an Amateur Radio license, you'll be more attractive on dates 😀

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More bits from Steve Stroh N8GNJ:

- SuperPacket blog - *Discussing new generations of Amateur Radio Data Communications - beyond Packet Radio (a precursor to Zero Retries)*
- N8GNJ blog - *Amateur Radio Station N8GNJ and the mad science experiments at N8GNJ Labs - Bellingham, Washington, USA*

Thanks for reading!
Steve Stroh N8GNJ
Bellingham, Washington, USA
2021-11-12

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Below is a much more complete "footer" that has evolved over 30+ issues of ZR.

Join the *Fun* on Amateur Radio

If you're not yet licensed as an Amateur Radio Operator, and would like to join the fun by *literally having a license to experiment with radio technology*, here are some pointers:

- **Ham Radio for Dummies** by Ward Silver N0AX is a great overview of Amateur Radio. N0AX is a gifted writer and HRFD is now in its 4th edition.
- My two favorite **YouTube** channels for a good overview of Amateur Radio are AmateurLogic.TV. and Ham Nation (part of Ham Radio Crash Course). These folks just seem to have so much fun!
- Radio Amateur Training Planning and Activities Committee (**RATPAC**) offers weekly presentations on general Amateur Radio topics (Wednesdays) and emergency communications in Amateur Radio (Thursdays).
- Dan Romanchik KB6NU offers a free **No-Nonsense Study Guide** for the Technician test (PDF).
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Closing the Channel

- In its mission to grow Amateur Radio and make it more relevant to society in the 2020s and beyond, Zero Retries is published via email and web, and is available to anyone at no cost. Zero Retries is proud *not to participate* in the Amateur Radio Publishing Industrial Complex!
- My ongoing Thanks to Tina Stroh KD7WSF for, well, *everything* and Bill Vodall W7NWP as *Zero Retries Instigator in Chief*.
- My ongoing Thanks to pseudostaffers Dan Romanchik KB6NU and Jeff Davis KE9V for continuing to spot, and write about "Zero Retries Interesting" type items, on their respective blogs, from Amateur Radio and beyond, that I don't spot on my own.
- Southgate Amateur Radio News consistently surfaces "Zero Retries Interesting" stories.
- The Substack email publishing platform makes Zero Retries possible. I recommend it for publishing newsletters.

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Thanks for reading!
Steve Stroh N8GNJ (He / Him)
These bits were handcrafted in beautiful Bellingham, Washington, USA

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